United States Patent [19]

Abraham et al.

[11] **4,269,162**

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[54] **SPRING TYPE BALL PITCHING APPARATUS**

[76] Inventors: **Jeffrey L. Abraham,** 218 Maplewood, San Antonio, Tex. 78216; **Gary D. Banse,** 546 Gilbert, San Antonio, Tex. 78213

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[51] **Int. Cl.**[3] **F41B 7/00**

[52] **U.S. Cl.** ..... **124/7;** 273/26 D; 124/50; 124/41 R; 221/200

[58] **Field of Search** ..... 124/7, 36, 41 R, 49, 124/50; 273/26 D

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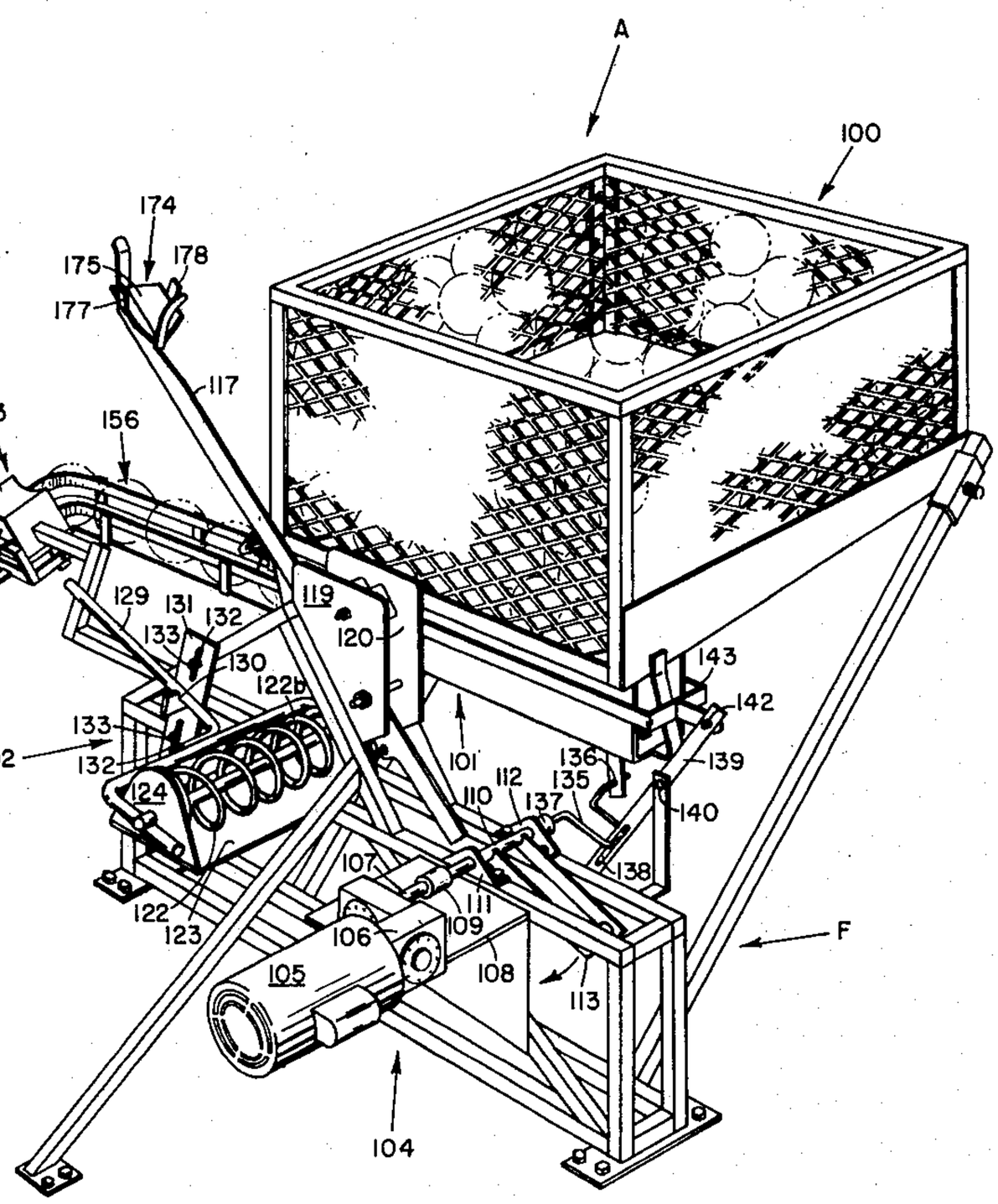
Primary Examiner—William R. Browne

Attorney, Agent, or Firm—Cox & Smith Incorporated

[57] **ABSTRACT**

A ball pitching machine having a spring powered pitching arm and having a dispensing mechanism with a de-jammer device for individually dispensing balls from a supply hopper and a ball loading device for automatically positioning a ball on the pitching arm for each cycle of the apparatus. A torsion adjusting mechanism is used to set the torsion of the coil spring to a prestressed first predetermined force value. The pitching arm applies an additional torsioning force to the coil spring resulting in a second greater predetermined stored force value in the coil spring. An adjustable link extends directly between and connects the coil spring to the pitching arm to maintain the amount of torsion in the coil spring at the first prestressed first determined force value.

4 Claims, 18 Drawing Figures



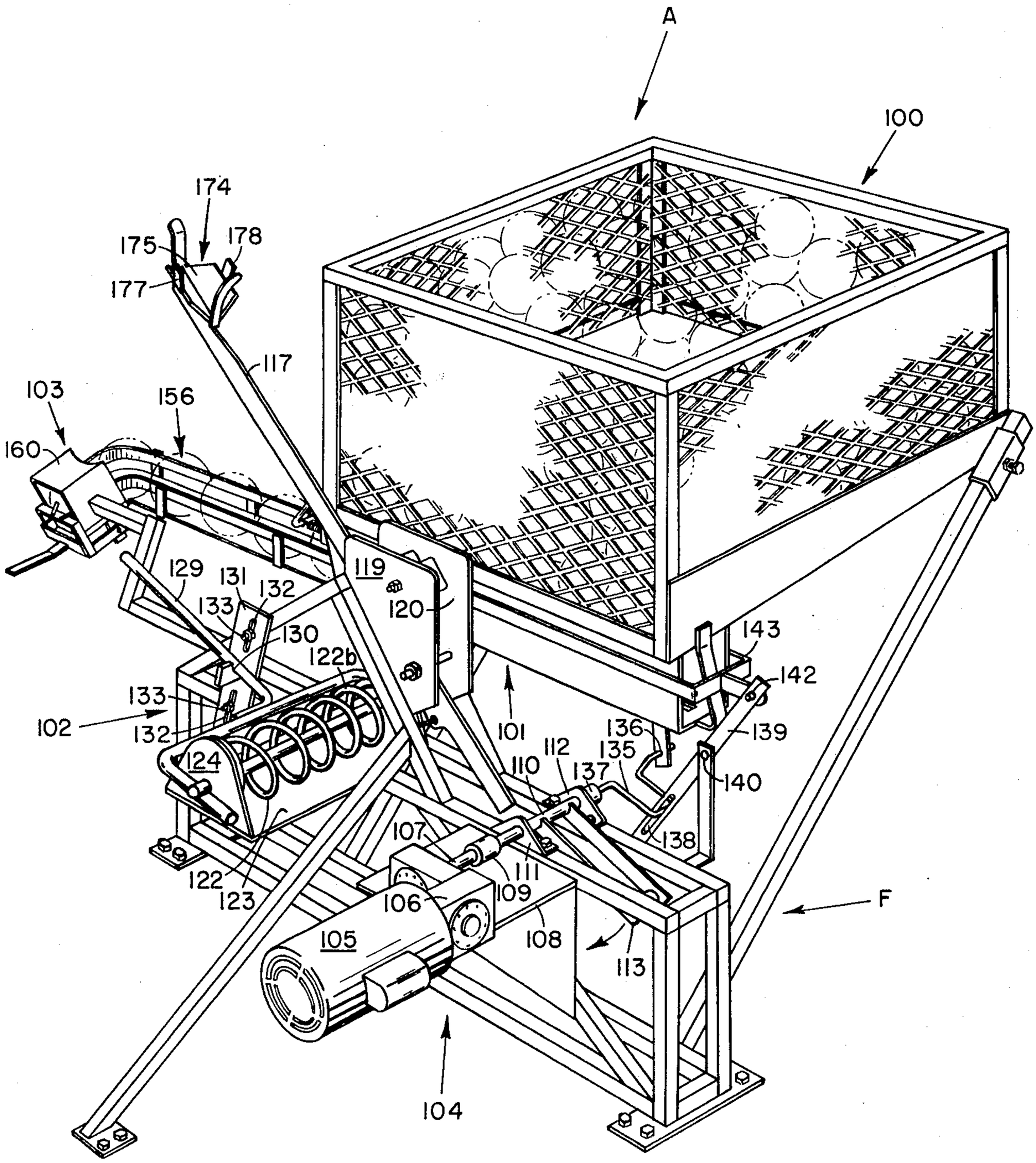

A
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FIG. 1

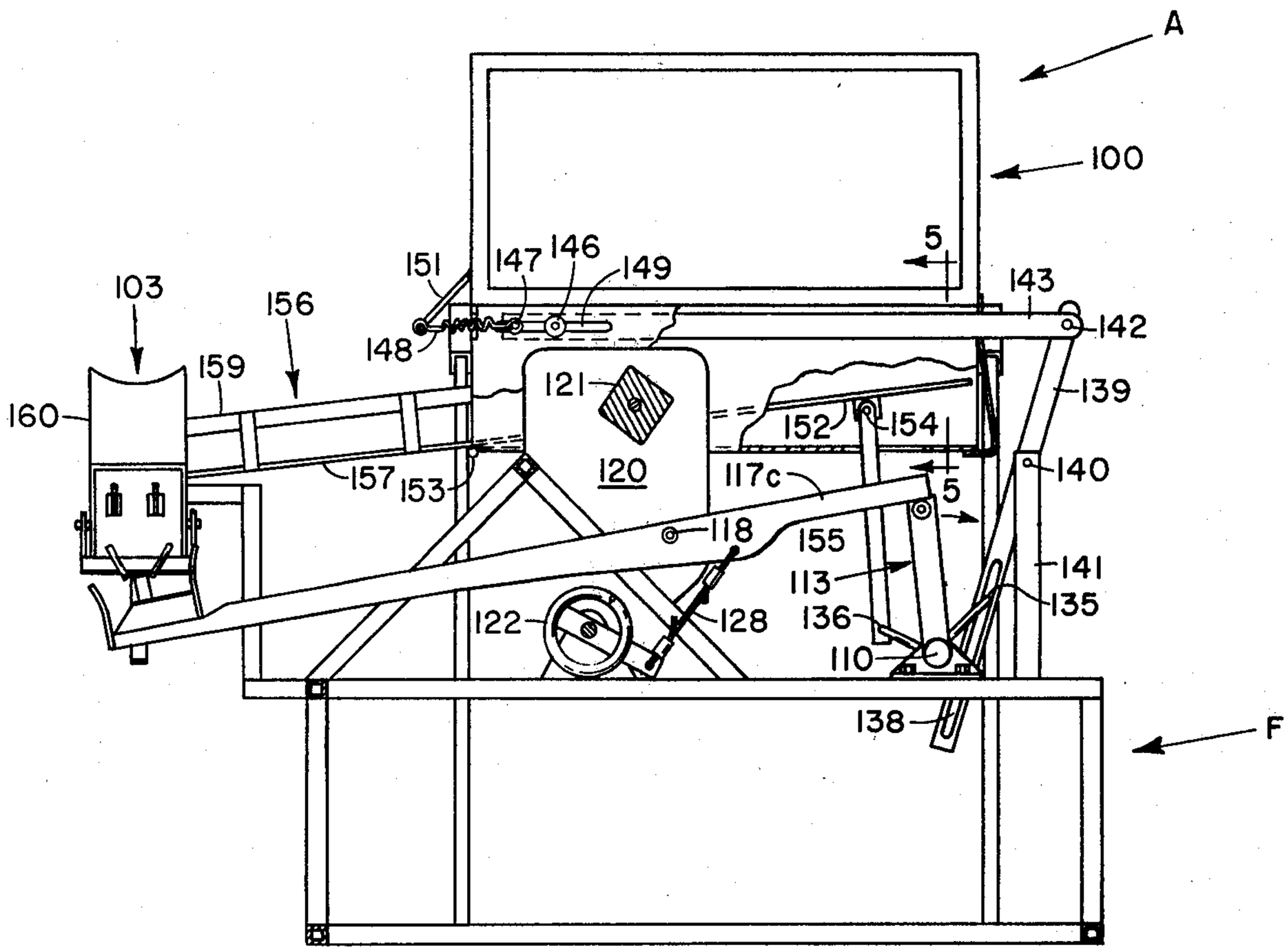

FIG. 2

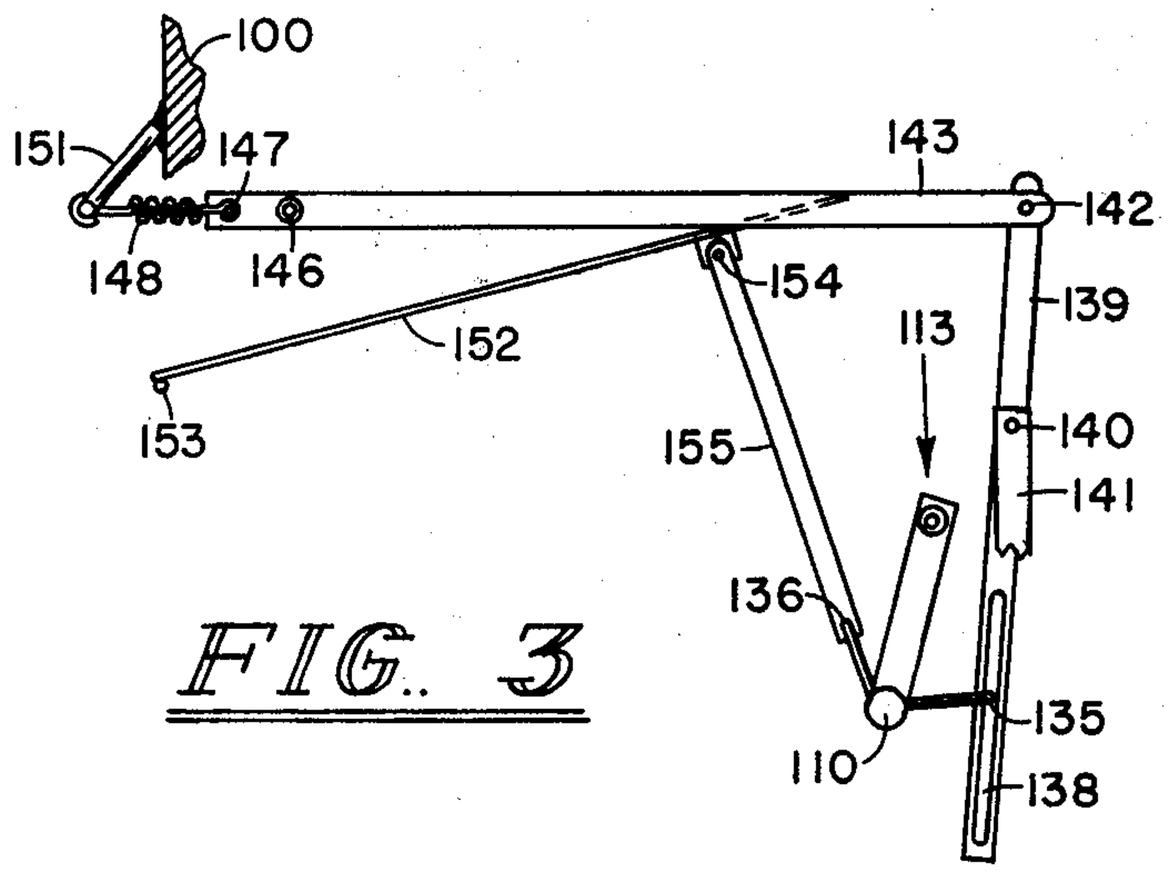

FIG. 3

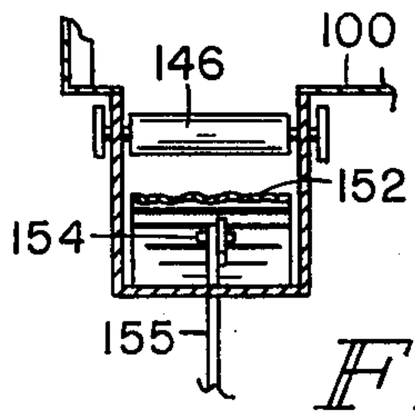

FIG. 5

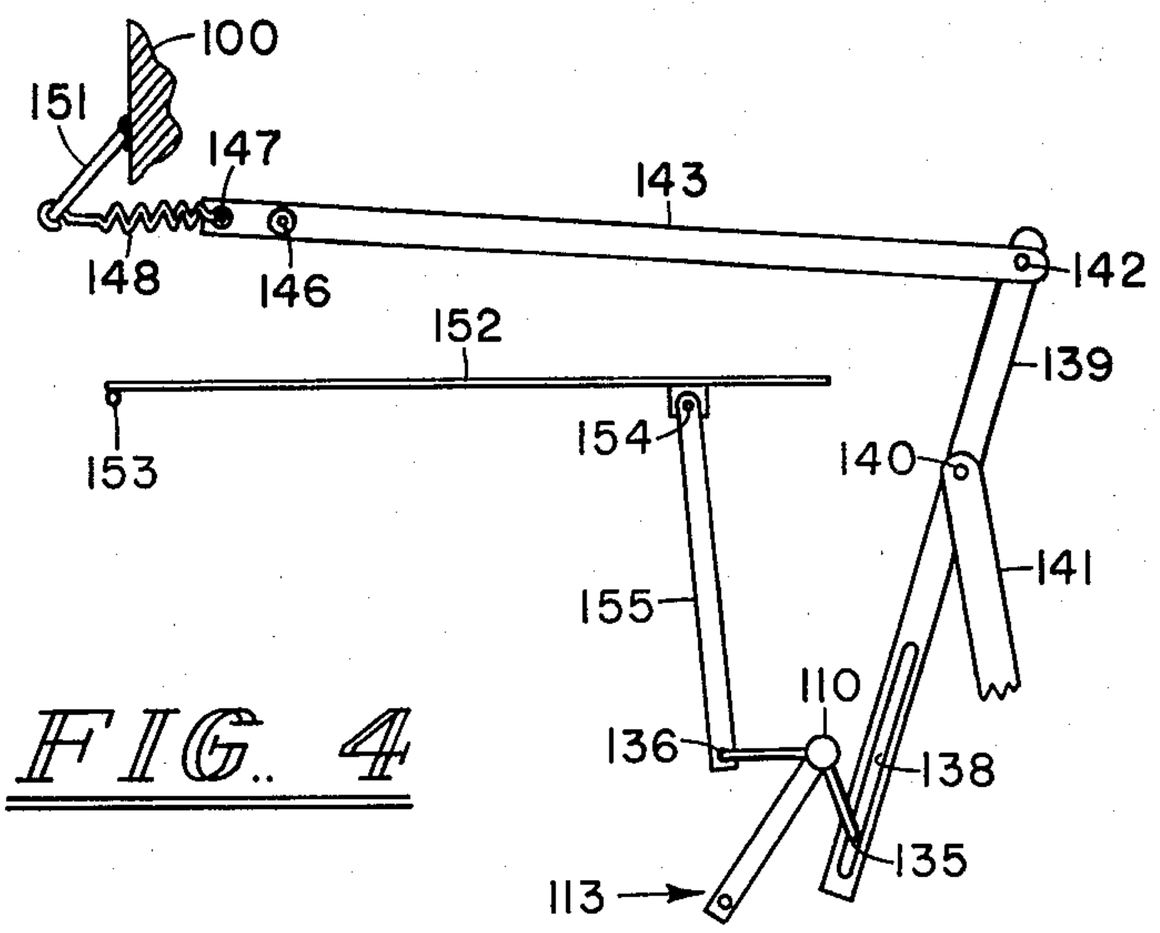

FIG. 4

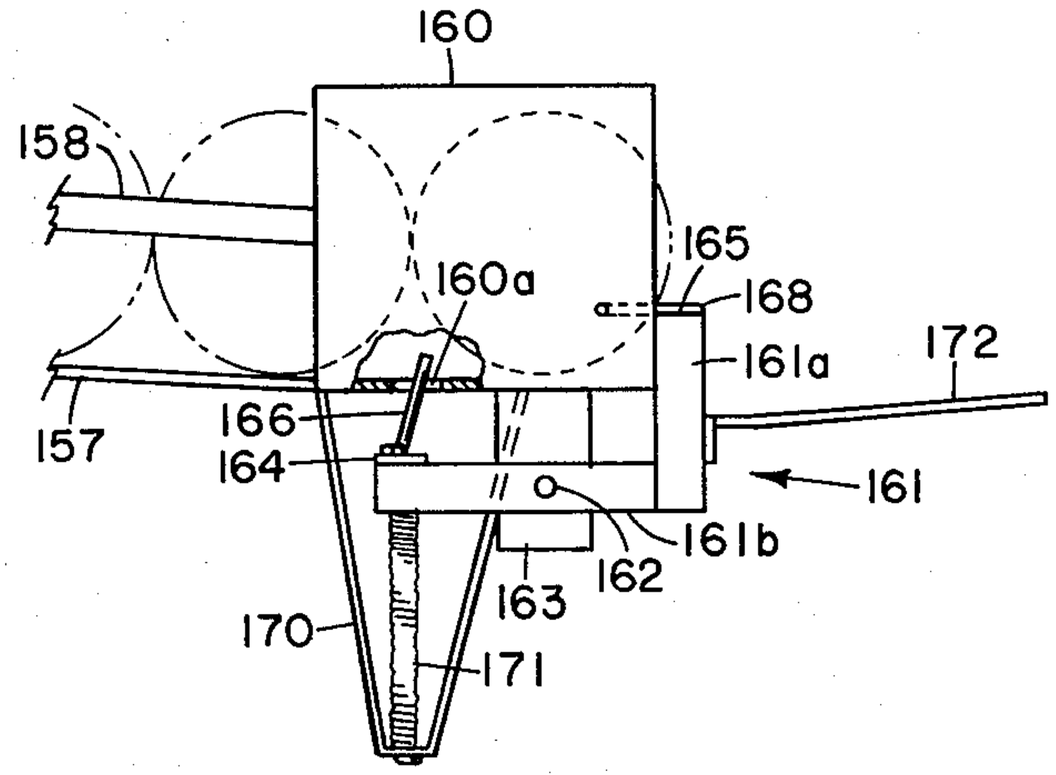

FIG. 10

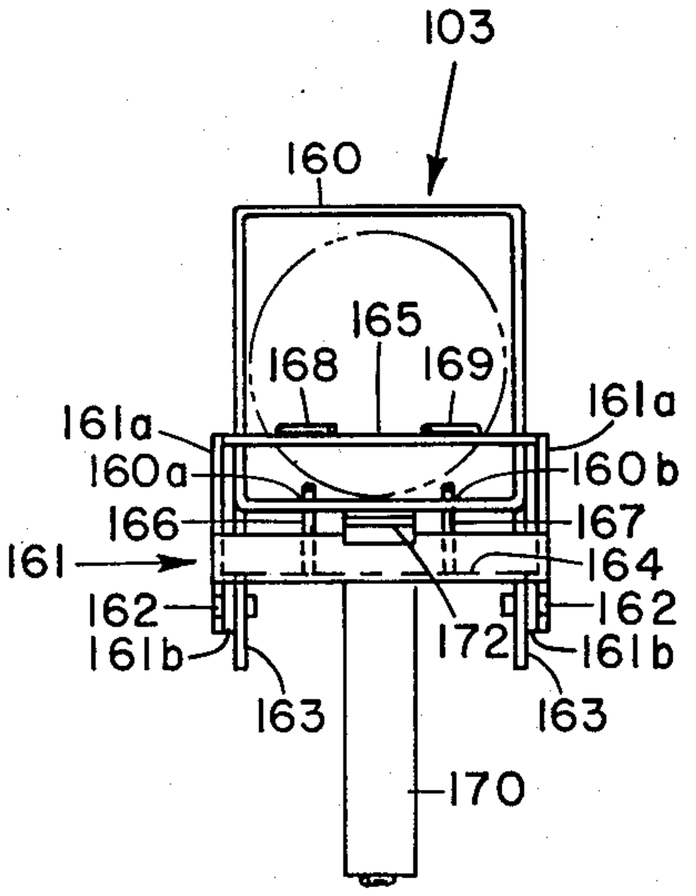

FIG. 11

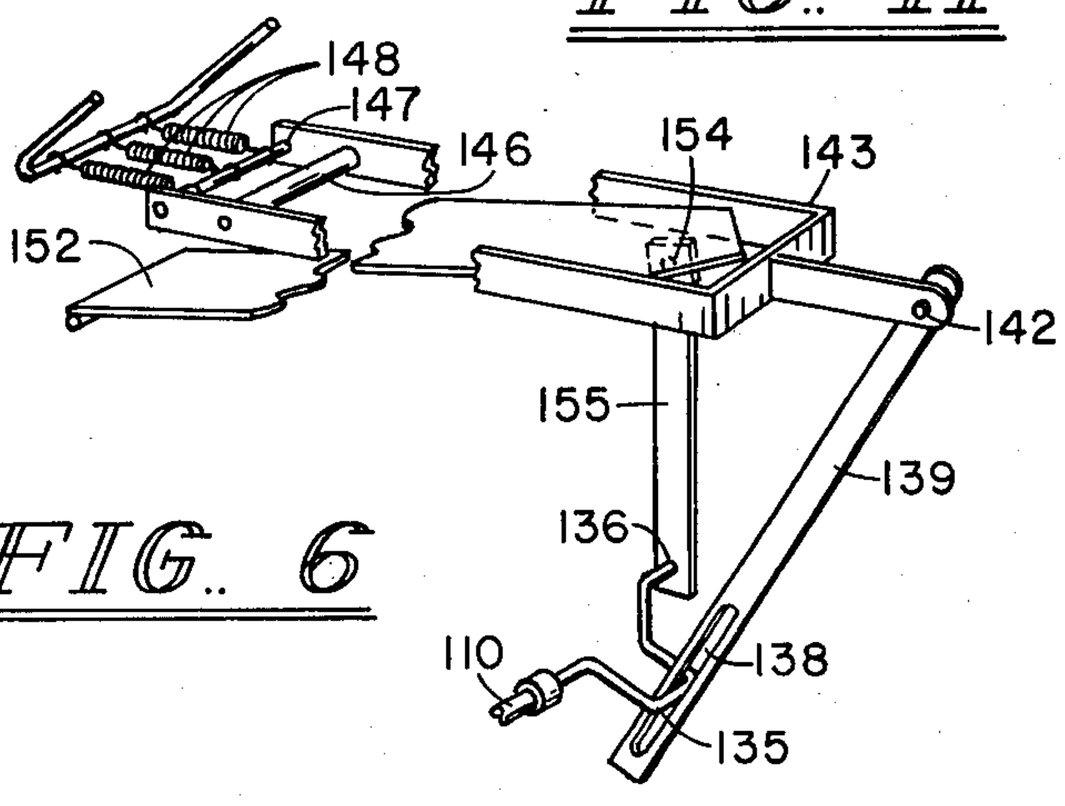

FIG. 6

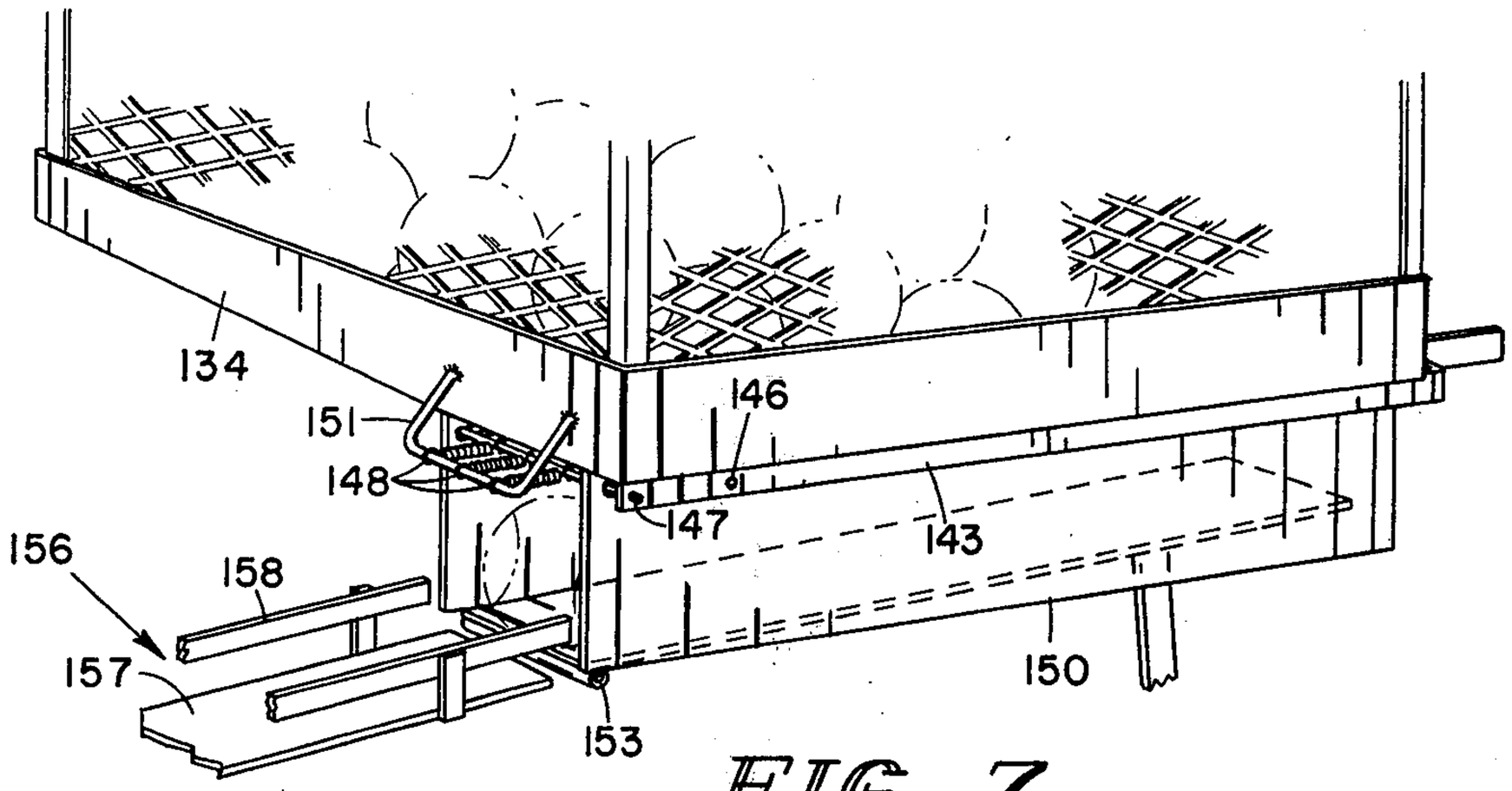

FIG. 7

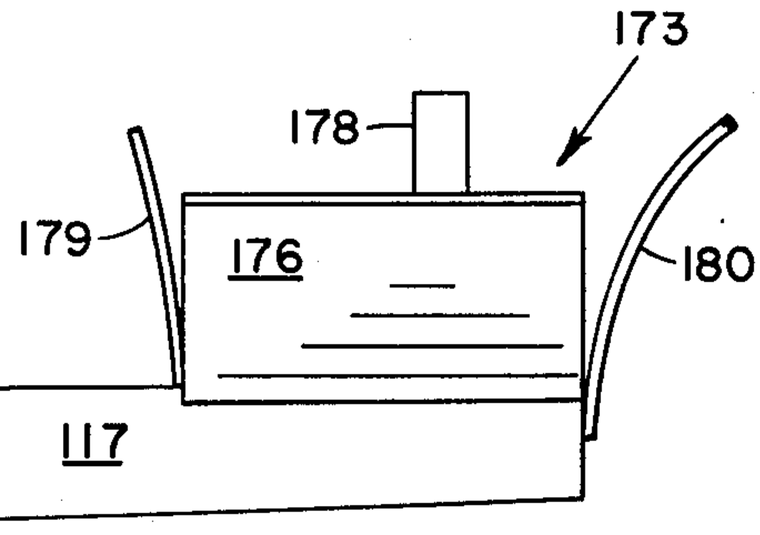

FIG. 13a

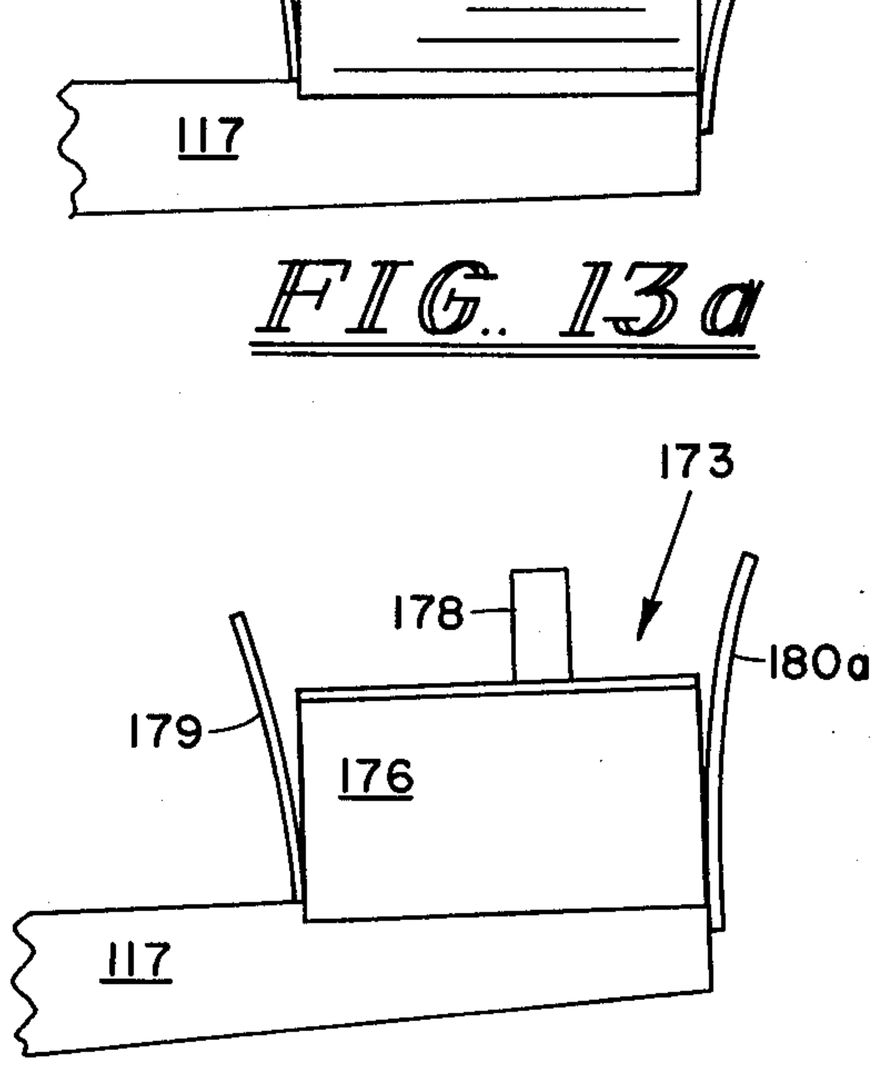

FIG. 13b

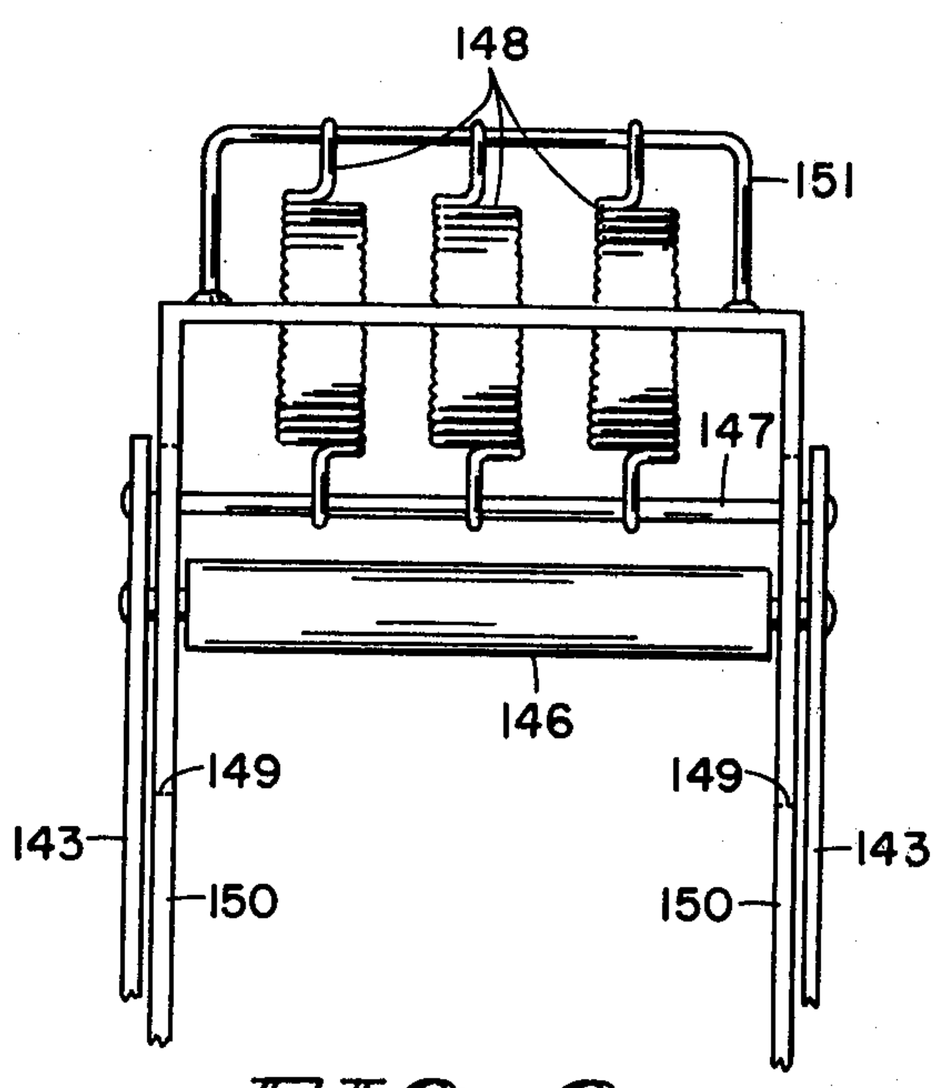

FIG. 8

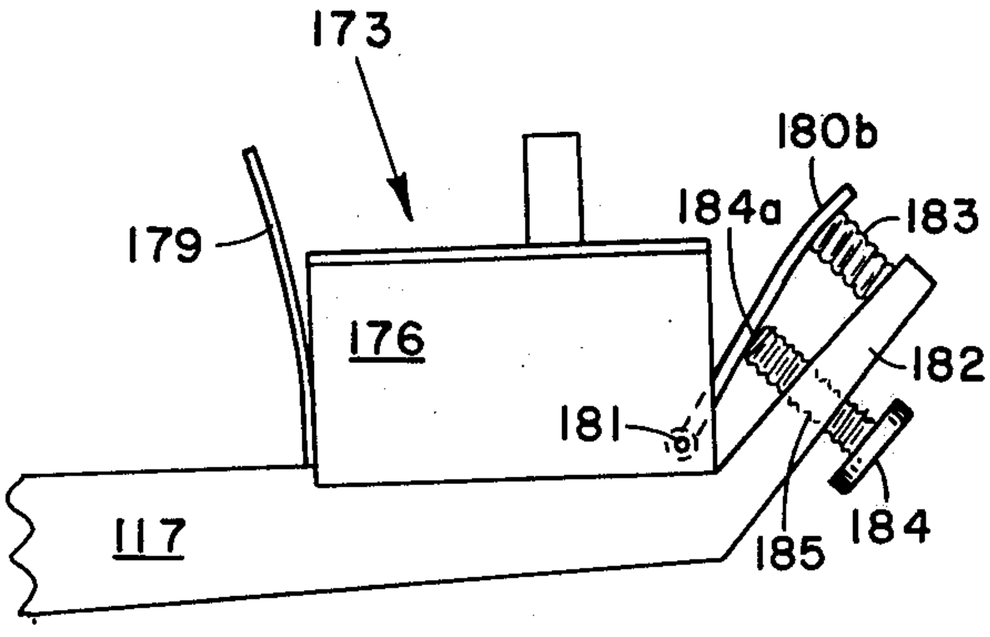

FIG. 13c

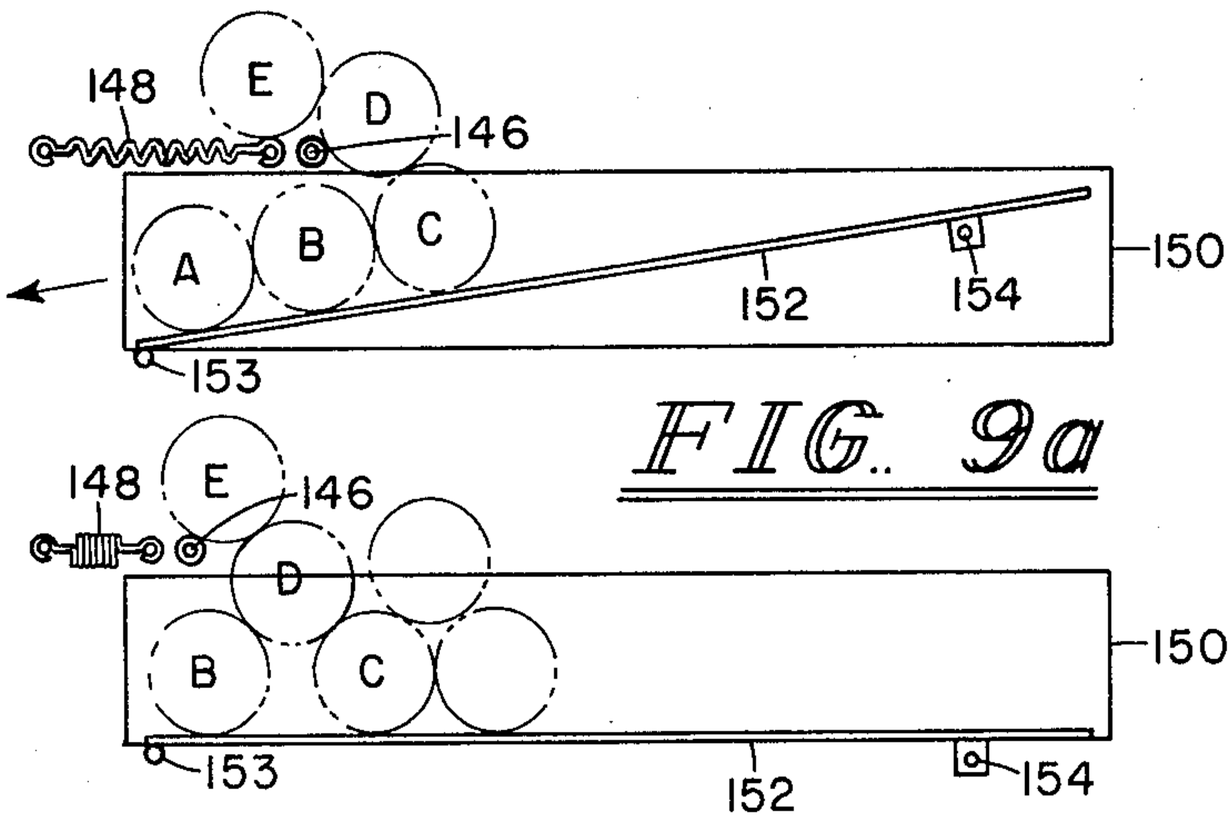

FIG. 9a

FIG. 9b

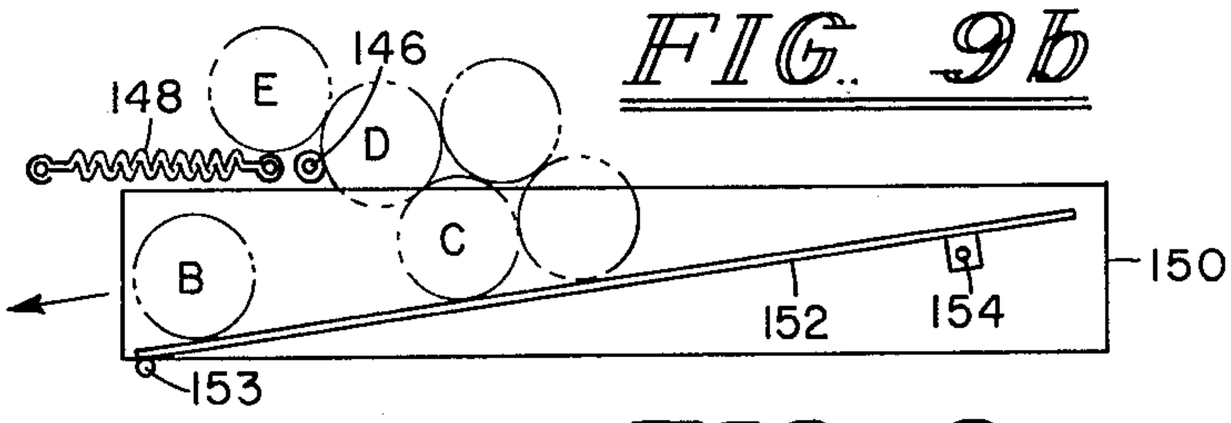

FIG. 9c

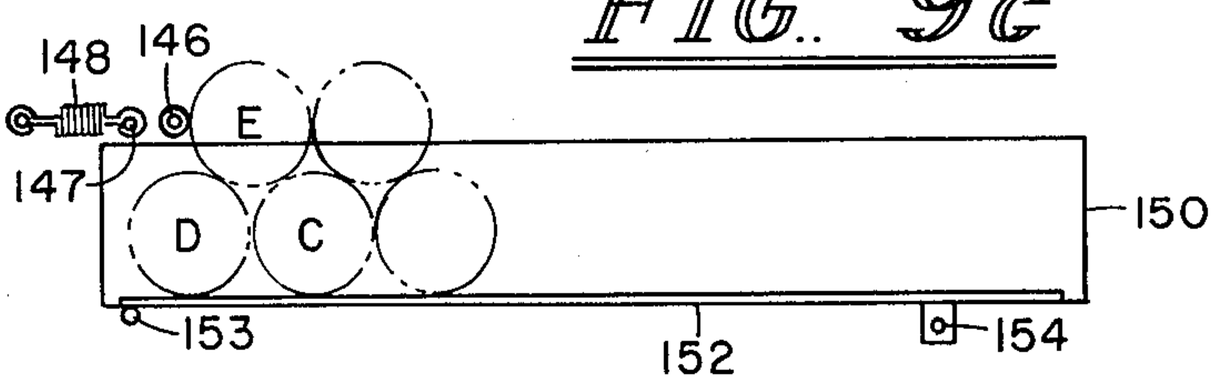

FIG. 9d

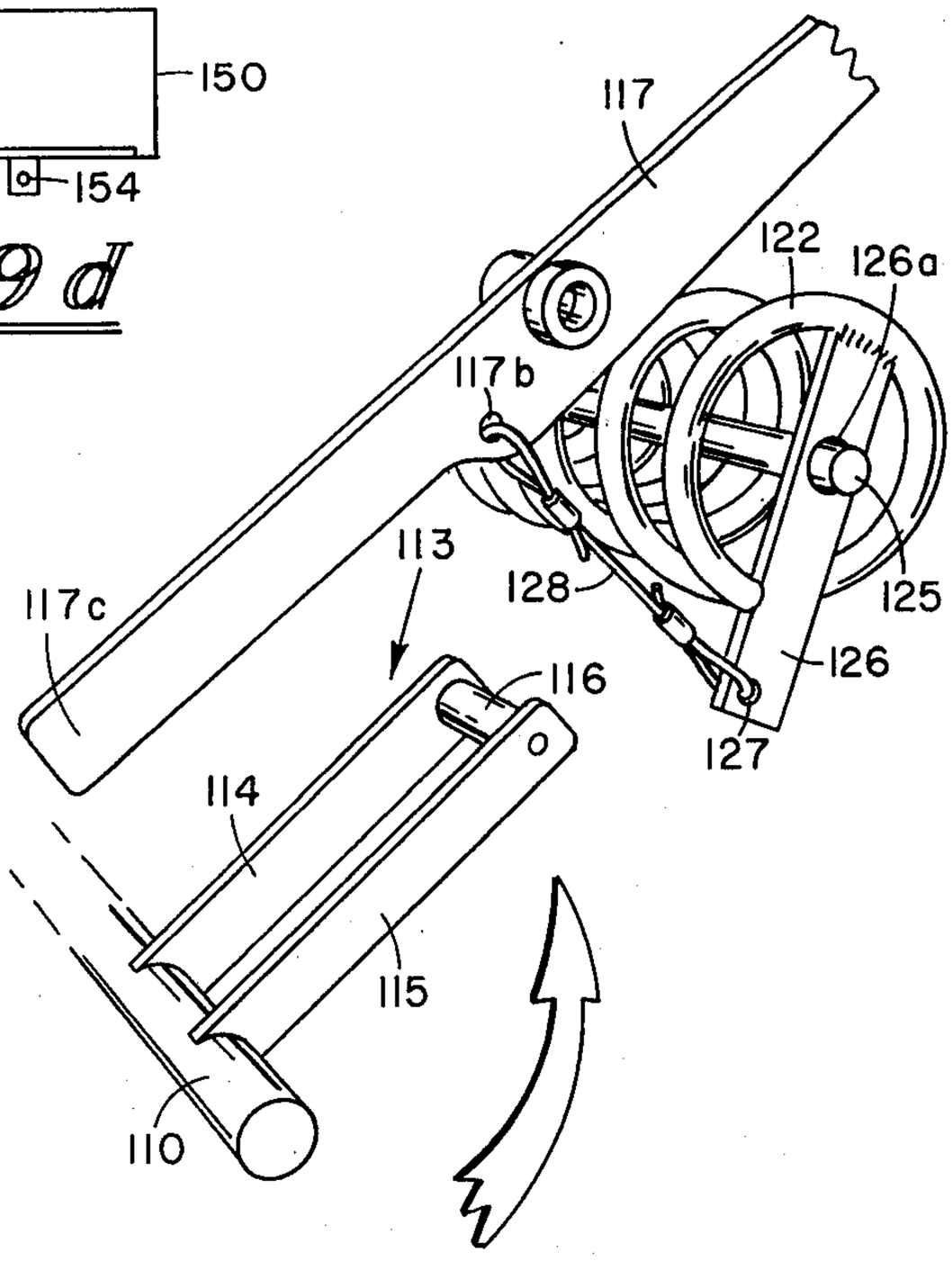

FIG. 12

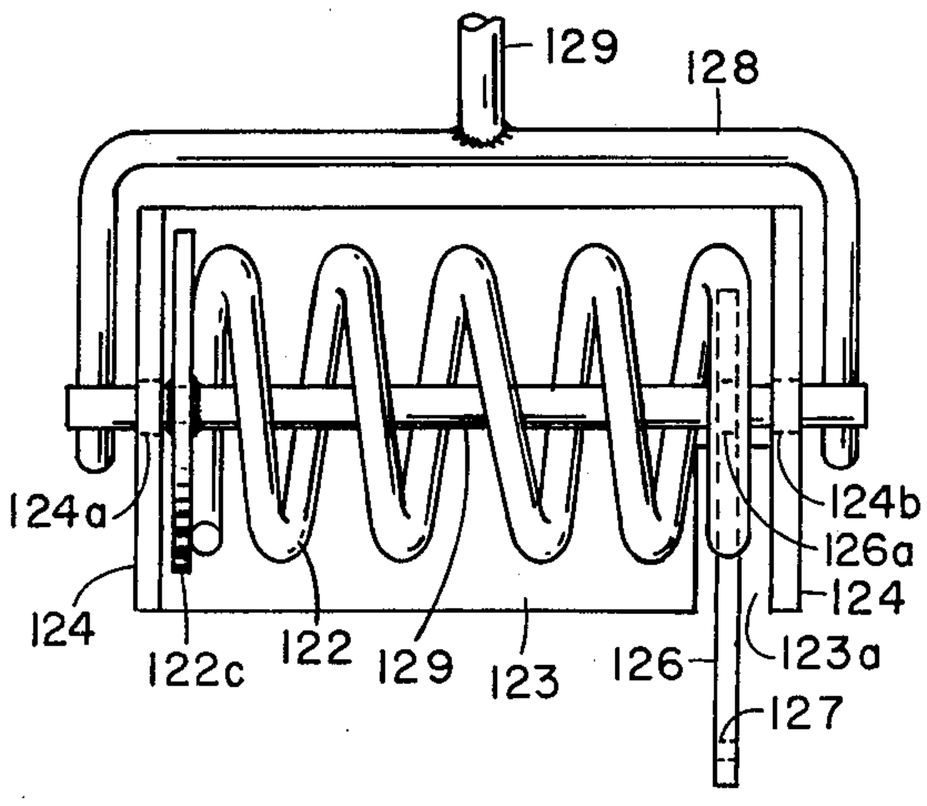

FIG. 14

SPRING TYPE BALL PITCHING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates generally to devices for automatically pitching balls for batting practice and particularly of the softball pitching type. More specifically, the invention is directed to a machine having an automatic feeding mechanism to allow the machine to sequentially pitch balls for batting practice or the like.

Ball pitching machines are well known in the prior art. Examples of some ball pitching machines are found in U.S. Pat. Nos. 1,152,186; 1,223,386; 1,825,882; 2,080,958; 2,082,818; 3,760,787; and 3,788,297. There is also known a baseball pitching device which uses two rotating wheels between which a ball is fed to be engaged by the wheel for projection.

As far as is known, the prior art devices have suffered from disadvantages which may prevent their utilization in commercial applications. Ball pitching machines typically may be used outdoors, which requires that the device be resistant or immune to exposure to weather conditions during periods of non-use. The size of ball pitching machines may make it inconvenient to keep the machines covered at all times, which may expose the machines to rain.

In order to be commercially feasible, the ball pitching machines should be reliable and be capable of repeatedly pitching balls with a minimal amount of attention from an operator. This requires a reliable feeding and loading mechanism to sequentially position the balls on a pitching arm. When balls are dumped into a hopper supply means, the balls tend to jam at the outlet and may not be individually discharged unless de-jammed. Also, the balls must be accurately dispensed each cycle of the machine. The use of gravity may not always be suitable for such an application, particularly when a large number of balls is made available in a storage bin for dispensing to the pitching arm.

SUMMARY OF THE INVENTION

A new and improved ball pitching apparatus, particularly for pitching softballs, having a spring powered, oscillating pitching arm which sequentially pitches balls at a predetermined rate to a batter. A dispensing basket or storage bin is provided on the apparatus for holding a large number of balls, so that the apparatus will provide repeated pitches to a batter. The dispensing basket includes a de-jammer mechanism which de-jams balls from the outlet of the basket to maintain a constant supply of balls to the pitching arm. A ball positioning or loading means is also provided to accurately dispense a single ball to a ball holder on the pitching arm for each cycle of the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the pitching apparatus showing a preferred embodiment of this invention.

FIG. **2** is a side view of the apparatus, partially in section, with portions deleted, showing the details of the pitching arm.

FIG. **3** is a partial view of the de-jammer mechanism for the basket.

FIG. **4** is an additional partial view of the de-jammer mechanism of the apparatus during another phase of operation of the apparatus.

FIG. **5** is a broken cross-sectional partial view taken along line **5—5** of FIG. **2**.

FIG. **6** is an additional partial view of the de-jammer mechanism of the apparatus.

FIG. **7** is another partial view of the de-jammer apparatus with a partial view of the basket for holding the balls.

FIG. **8** is a partial view of the de-jammer mechanism of the apparatus.

FIGS. **9A**, **9B**, **9C** and **9D** are partial schematic views depicting the sequence of operations involved in dispensing a ball from the basket with the de-jammer mechanism.

FIG. **10** is a partial view of the loading mechanism for positioning the ball on the throwing arm.

FIG. **11** is another partial view of the loading mechanism for positioning a ball on the throwing arm.

FIG. **12** is a partial view depicting the spring mechanism which powers the pitching arm.

FIG. **13A** depicts the ball throwing portion of the pitching arm.

FIG. **13B** depicts a modified version of the ball throwing portion of the pitching arm.

FIG. **13C** is another partial view depicting the spring mechanism for the pitching arm.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to the drawings there is shown a ball pitching apparatus A in accordance with the invention. The apparatus A includes a ball holding basket generally designated by the numeral **100**. The ball holding basket or hopper **100** includes a ball feeding apparatus including a de-jammer mechanism, designated generally by the numeral **101**. The apparatus further includes a ball pitching means **102**. The apparatus A further includes a ball loading apparatus including a ball loading mechanism **103** which delivers a single ball from the ball de-jammer mechanism to the ball pitching arm during each sequence of operation of the machine. A drive means **104** is provided to cock and release the pitching arm and also to operate the ball de-jammer mechanism for each cycle of the machine. The apparatus A includes a frame S which supports the components of the apparatus and which is preferably mounted on a suitable support which may be permanent or portable.

The apparatus generally operates as follows. A plurality of balls are dispensed from the ball holding basket **100** by the ball de-jammer mechanism **102** for supplying to the ball loading mechanism **103**. The drive means **104** cocks the ball pitching means **102** which includes a pitching arm. The pitching arm engages the ball loading mechanism **103** to supply a single ball to the pitching arm. The drive means **104** cocks the pitching arm for each cycle of the machine and also at the same time operates the ball de-jammer mechanism to maintain a supply of balls to the ball positioning mechanism **103**.

The drive means **104** includes a suitable motor **105** which typically may be electric. The motor **105** is coupled to a reduction gear unit **106** which includes a rotating output shaft **107**. The motor **105** is connected with suitable circuits for activation of the motor and may also include suitable means for varying or otherwise controlling the rotating speed of the motor which determines the cyclical time for the apparatus. The reduction gear box **106** is of conventional sealed construction and the gear reduction is matched to the output speed of the

motor to provide the proper speed for the rotating output shaft **107**. The motor and gear box are mounted on a suitable frame member **108**.

A conventional coupling **109** is provided for connecting the output shaft to the main drive shaft **110** of the apparatus. The main drive shaft **110** is mounted for rotation in journals **111** and **112** which are secured to the frame F by suitable means such as bolts. Suitable bearings may be provided in the journals **111** for rotating of the drive shaft therewith. Rigidly secured with the drive shaft **110** is a cocking means **113** which comprises two straps **114** and **115**, as best shown in FIG. **12** and a friction reducing roller **116** mounted for rotation at the ends of the straps **114** and **115**. As will be apparent, rotation of the drive shaft **110** through the motor **105** and gear box **106** will also cause the cocking means **113** to rotate, as indicated by the arrow in FIG. **1** and FIG. **12**.

The ball pitching means **102** includes a pitching arm **117** as shown in FIGS. **1** and **2** which is mounted for rotation on shaft **118**. The shaft **118** is mounted between the parallel plates **119** and **120**, as shown in FIG. **1**. The plates **119** and **120** are rigidly secured to the frame F. Also mounted between the plates **119** and **120** is a bumper block **121**, which may be made out of rubber or other suitable resilient material which is capable of absorbing a blow from the arm **117** during each cycle of the machine. The location of the block **121** affects the arc of the ball thrown from the pitching arm. The lower end **117C** of the pitching arm is adapted to engage the roller **116** as best shown in FIG. **2** with the pitching arm fully cocked just prior to release. During the rest position of the arm **117**, the bumper block **121** may be engaged. A coil spring **122** is provided to supply power to the arm. This coil spring **122** is mounted in a support bracket **123** as best shown in FIG. **14**, which is secured to the frame F. The support bracket **123** is generally C-shaped, as best shown in FIGS. **1** and **4** and includes ears **124** at each side thereof. A shaft **125** is provided extending through the center of the spring, with the shaft **125** mounted for rotation relative to the apertures **124***a* and **124***b* in the ears. At one end of the spring **122**, as best shown in FIG. **12**, a strap **126** is provided with one end of the strap **126** secured to the spring by suitable means such as welding. The strap **126** includes an aperture **126***a* for rotatably receiving shaft **125** and aperture **127** at its end farthest from the spring. Slot **123***a* is provided for rotation of strap **126** so the strap **126** will not engage the bracket **123**. A cable **128** of predetermined length is provided to connect the strap **126** with the arm **117**. As best shown in FIG. **2**, the cable means **128** extend through an aperture **127** and the strap **126**, and an additional aperture **117B** in the arm **117**. The cable provides some adjustment of the throwing power of the pitching arm and a rigid strap could be substituted for the cable.

The shaft **125** is free to rotate relative to the right-hand portion of the spring **122**, due to aperture **126***a*. However, the lefthand portion of the spring **122B** is rigidly secured for rotation with the rod **125** by a suitable means such as a disc **122***c* welded to the end of the spring or a strap connected to the spring and rigidly secured to the rod **125**, by suitable means such as welding. Secured to opposite ends of the shaft **125** is U-shaped member **128** which further includes an extension lever arm **129** secured therewith. The lever arm **129** rests in a notch **130** in a tension adjusting bracket **131**. The torsion adjusting bracket **131** includes a plurality of elongated slots **132** which receive bolts **133** which adjustably secure the torsion adjusting bracket **132** to the frame F. The outer end of the extension **129** is adapted to be grasped by hand for rotation of the rod **125**. As will be apparent, rotation of the rod **125** will torsion the spring **122** since the engagement of the strap **126** with the support bracket **123** prevents rotation of the spring at one end. However, the spring **122** is rigidly connected at **122B** with the rod **125** through disc **122***c*, so that rotation of the shaft **125** will adjust the torsion of the coil spring **122**. In other words, the shaft **125**, as shown in FIG. **12**, is rotatably inserted through an opening **126***a* in the strap **126** while the shaft **125** is rigidly connected to the other end through disc **122***c*.

Rotation of the cocking means **113** causes the roller **116** to rollably engage the end **117***c* which will cause the arm **117** to rotate to the position shown in FIG. **2**. In this position, the cable **128**, which is connected between the arm and the the strap **126** has caused the strap **126** to rotate against the forces of the spring to store a predetermined amount of energy in the spring. When the cocking means **113** reaches the position as shown in FIG. **2**, the arm **117** will be in a fully cocked position with the maximum torsion in the spring **122**. As will be apparent, further rotation of the cocking means **113** will engage the roller **116** with the lower end **117***c* of the pitching arm, which will cause the pitching arm to rotate until it engages the bumper block **121**. The pitching arm is particularly designed for slow pitch softball in that it throws a ball at a predetermined arc as desired.

Ball holding basket **100** includes a sloped floor **134** for supplying balls to the ball de-jammer mechanism **101**. The floor **134** of the ball holding basket **100** does not extend over the ball de-jammer mechanism so that balls will flow by gravity into the de-jammer mechanism. The drive for the de-jammer mechanism as shown in FIG. **1**, includes a crank means having a first crank arm **135** and a second crank arm **136**. The crank arms **135** and **136** are connected by a suitable coupling **137** to the main drive shaft **110**. Accordingly, rotation of the main drive shaft **110** will also rotate the cranks **135** and **136**. The crank **135** as shown in FIGS. **1** and **2**, extends through a slot **138** in oscillating arm **139**. The arm **139** is mounted for rotation about a pivot pin **140** on upstanding bracket **141** which is secured to the frame F. A portion of the ball de-jammer mechanism is rotatably secured by a pin **142** at the upper end of the arm **139**. The pin **142** is connected to a bifurcated member **143** which forms a part of the de-jammer mechanism. The shape of the bifurcated member **143** is best shown in FIG. **6** of the drawings. The bifurcated member **143** extends along the open portion of the floor of basket **100** and is mounted for reciprocation with the basket **100**. At the open end of the bifurcated member **143** is a ball de-jammer including a roller **146** which is mounted for rotation relative to the member **143**. A fixed member might be substituted for the roller, although the rotation of the roller upon engagement with the ball is desired to avoid damage to the balls. A cross bar **147** is also provided for connection to a plurality of springs **148**. Slots **149** (only one of which is shown) are provided in the de-jammer delivery trough **150** for receiving the roller **146** and pin **147** to allow the member **143** to reciprocate. The springs **148** are attached to a bracket member **151** which is secured to the basket as best shown in FIGS. **3**, **4** and **7**. Springs **148** block the passage of balls between the pin **147** and the basket to prevent jamming of the outlet of the trough **150** so that balls will be freely dis-

pensed. A sliding panel in a slot in the basket or other suitable means could be substituted for the springs.

The de-jammer mechanism further includes a pivoted floor member **152**, pivotally mounted at **153** to the ball delivery trough **150**. The plate **152** is pivotally connected through pin **154** to an arm **155**, which extends through a slot (not shown) in the trough and which includes an aperture through which the crank member **136** extends. Accordingly, rotation of the crank member **136** will cause the floor member **152** to oscillate or tilt about the pin **153**, as best shown in FIGS. **9A**, **9B**, **9C** and **9D**. A guide channel means **156** is provided to receive balls from the ball delivery mechanism and gravity feeds the balls to the ball positioning mechanism **103**.

The operation of the ball de-jammer mechanism is best depicted in FIGS. **9A** through **9D**. Rotation of the drive shaft **110** will in turn cause the cranks **135** and **136** to rotate which will pivot the arm **139** about the pin **140** and cause the arm **155** to reciprocate to pivot the floor **152** about the pin **153**. In other words, the floor **152** will be raised at its right end, as shown in FIG. **9A**, to form an incline plane to cause the balls to roll down it. FIGS. **9A** and **9B** depict one complete cycle of the ball de-jammer mechanism and FIGS. **9C** and **9D** depict another complete cycle. Rotation of the crank **135** will cause the roller **146** to move to the right as shown in FIG. **9A**, so that the balls depicted as E and D will not be resting on the balls A and B, so that the balls A and B are free to roll out of the ball delivery trough **150** into the channel **156**. Springs **148** prevent any balls from falling down against the balls A or B which might prevent the balls from being discharged out the delivery trough **150**. During the rest position, the floor **152** is substantially horizontal, so that substantially no gravity forces are provided against the ball B to cause it to roll into the channel **156**. During a second cycle of the apparatus, the floor **152** will be inclined again, as shown in FIG. **9C** and the roller **146** will engage the ball D, which in turn engages the ball C so that no balls will be resting on the ball D, so that it may freely roll into the channel **156**. Movement of the roller **146** to the left, as shown in FIG. **9D**, will allow the balls to assume the rest position with the floor **152** again substantially horizontal so that substantially no gravity forces are applied to the balls to force them out the channel. The above process is repeated for each cycle of the machine, so that balls will be delivered into the inclined channel **156** without jamming up in the basket **101** to continuously supply balls to the pitching arm **117**.

As balls are dispensed from the basket **100**, they roll down the inclined channel **156** which includes a bottom member **156** and side rails **158** and **159**. As shown in FIG. **1**, a plurality of balls roll along the channel **156** from the basket **100** to be delivered to the ball positioning mechanism **103**.

The ball loading mechanism **103** (FIGS. **10–11**) includes an enclosed channel member **160** which forms a continued pathway with the channel **156** through which the balls roll. It is understood that the mechanism **103** is tilted, as shown in FIGS. **10–11**, although it is shown as level in FIGS. **10–11** for clarity. As best shown in FIG. **10**, ball positioning mechanism **103** includes a loading member **161** which is attached to pivot pins **162** through lower extending brackets **163**, which bracket is secured to the enclosed channel member **160**.

As best shown in FIG. **11**, two brackets **163** extend downwardly from the enclosed channel member **160** for pivotally mounting the loading member **161** on pins **162**. The member **161** includes two perpendicular legs **161*a*** and **161*b*** with a cross member **164** connecting the ends of the legs **161*b*** and an additional cross or connecting member **165**, connecting the ends of the legs **161*a***. A channel blocking means including prong members **166** and **167** extend upwardly from the cross or connecting member **164** as shown in FIGS. **10** and **11** to engage a ball within the enclosed channel member **160**. As will be apparent, upon rotation of the member **161** about the pivot pins **162** the prongs **166** and **167** will be raised upwardly through openings **160*a*** and **160*b*** in the lower base portion of the enclosed channel member to engage a ball within the channel member and to block balls within the channel **156** from entering the channel member **160**. A ball retaining means including two additional prongs **168** and **169** are provided to prevent rolling of a ball out of the channel member until the member **161** is pivoted about the pin **162**. A V-shaped bracket **170** is provided attached to the lower base portion of the channel member **160** for mounting a spring **171** which is secured to the V of the V-shaped bracket **170** and to the cross member **164**. Accordingly, the spring **171** will bias the legs **161*a*** of the L-shaped member **161** until they engage the right hand end as viewed from FIG. **10** of the channel member **160**. Arm engaging member **172** is provided to be engaged by the pitching arm **171**, as best shown in FIG. **2**. Upon cocking of the pitching arm, whose position is shown in FIG. **2**, the pitching arm **117** will engage the member **172** to cause the L-shaped member **161** to rotate about the pins **162** and load a ball which is positioned in the channel member **160** into the ball port member **173**, which is best shown in detail in FIGS. **13A** and **13B**.

The ball support means **173** includes a V-shaped cradle member **174** which is made of plates **175** and **176*c*** which are secured to the pitching arm **117** by suitable means such as welding. Side tabs **177** and **178** are provided to retain a ball within the V-shaped support **174**. A front tab member **179** is also provided to prevent a ball from rolling out of the V-shaped support **174**. The rear tab member **180**, as shown in FIG. **13A** has a degree of curvature or inclination which is determinative of the curvature of the ball which is thrown from the V-shaped support **174**. As shown in FIG. **13B**, the rear tab **18*a*** is positioned forward which would tend to reduce the arc of the ball exiting the V-shaped trough upon release of the cocking means **113** from the end **117*c*** of the pitching arm. With the rear tab oriented as shown in FIG. **13A**, the ball will be given a greater arc, i.e. higher, than would be achieved with the tab position as shown in FIG. **13B**.

FIG. **13C** shows another embodiment of the ball support means, which includes components comparable to those of FIGS. **13A** and **13B**, which components have like reference numerals. FIG. **13C** comprises a tab member **180*b***, which is pivotally mounted about a pin **181** which is secured with the plate members **175** and **176**. A fixed arm member **182** is mounted on the arm **117** as shown in FIG. **13C** and includes a spring **183** which is connected between the arm **182** and the tab **180*b***. A thumb screw **184** extends to a threaded opening **185** in the arm member **182** with its end **184*a*** engaging the tab **180*b*** due to the spring **183**. As will be apparent, an adjustment of the thumb screw **184** will change the angle of inclination of the tab **180B** which will affect the arc of the ball exiting the ball support means **173**. The construction shown in FIG. **13C** enables ready adjust-

ment of the tab **180** without bending thereof which could result in failure of the tab after repeated bending.

While there has been shown and described a preferred embodiment of a ball pitching apparatus in accordance with the invention, it will be appreciated that many changes and modifications may be made therein without, however, departing from the essential spirit of the invention within the scope of the claims.

We claim:

1. A spring powered pitching arm for a ball pitching means for a ball pitching machine, comprising:

an oscillating pitching arm rotatably mounted upon a ball pitching machine for oscillating in a vertical arc;

a power drive means operatively connected with the pitching arm for pivoting the pitching arm one direction in the arc;

a selectively torsionable coil spring operatively connected with the pitching arm to impart a pitching force to the pitching arm upon torsioning of the coil spring by the movement in the one direction by the pitching arm and release of the pitching arm by the power drive means to allow the pitching arm to be moved in the opposite direction by the coil spring to provide the pitching motion;

a spring torsion adjusting means for setting the torsion of the coil spring to a prestressed first predetermined force value prior to additional torsioning of the coil spring by the movement in the said one direction by the pitching arm, said pitching arm applying the additional torsioning force to the coil spring resulting in a second greater predetermined stored force value in the coil spring to control the pitching force imparted to the pitching arm upon release by the drive means; and

an adjustable link extending directly between and connecting the coil spring to the pitching arm to maintain the amount of torsion in the coil spring at the prestressed first predetermined force value prior to torsioning of the coil spring by the movement in the one direction by the pitching arm and at the end the arc of of the pitching arm to control the amount of pitching force imparted to the pitching arm.

2. The apparatus as set forth in claim **1**, including:

a rotating pitching arm cocking means driven by the power drive means to engage and pivot the pitching arm in the one direction and torsion the coil spring to the second predetermined value which provides the pitching force applied to the pitching arm.

3. The apparatus as set forth in claim **1**, wherein:

the spring torsion adjusting means including an adjustable lever arm to set the torsion of the coil spring to the first predetermined value prior to torsioning of the coil spring by the movement in said one direction by the pitching arm.

4. A spring powered pitching arm for a ball pitching means for a ball pitching machine, comprising:

an oscillating pitching arm rotatably mounted upon a ball pitching machine for oscillating in a vertical arc;

a power drive means operatively connected with the pitching arm for pivoting the pitching arm in one direction in the arc;

a selectively torsionable coil spring operatively connected with the pitching arm to impart a pitching force to the pitching arm upon torsioning of the coil spring by the movement in the one direction by the pitching arm and release of the pitching arm by the power drive means to allow the pitching arm to be moved in the opposite direction by the coil spring to provide the pitching motion;

a spring torsion adjusting means for setting the torsion of the coil spring to a prestressed first predetermined force value prior to additional torsioning of the coil spring by the movement in the said one direction by the pitching arm, said pitching arm applying the additional torsioning force to the coil spring resulting in a second greater predetermined stored force value in the coil spring to control the pitching force imparted to the pitching arm upon release by the drive means;

the spring torsion adjusting means including an adjustable lever arm to set the torsion of the coil spring to the first predetermined value prior to torsioning of the coil spring by the movement in one direction by the pitching arm; and

a torsion adjusting bracket engaging the lever arm for controlling the position of the lever arm to maintain the torsion of the coil spring at the first predetermined value.

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